

Zero Retries issue 0175 2024-10-25

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Radios are computers - with antennas! Now in its fourth year of publication, with 2200+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0175>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My thanks to **Bob Kehr KA9MDP** for becoming an **Annual Paid Subscriber** to Zero Retries this past week!

My thanks to **Prefers to Remain Anonymous 55** for *upgrading* from a free subscriber to Zero Retries to a **Paid Subscriber** this past week!

Financial support from Zero Retries readers is a significant vote of support for the continued publication of Zero Retries.

Pacificon 2024 - A Good Time Was Had By All

I attended Pacificon 2024 for the first time and I really enjoyed the experience to the point of likely attending (and speaking) again in 2025. Being held in the San Francisco Bay Area of California, it was generally “techier” than most Amateur Radio conferences that I’ve attended lately and thus more fun for me personally. Keeping the entire conference with a large conference hotel was really great - pop up to the hotel room when needed, decent food (and drinks) onsite, etc. made for a really pleasant experience.

After Pacificon wrapped up on Sunday afternoon, my wife Tina and I, and our two new kittens Shrekky and Fiona, all decided to cut our post-Pacificon activities in California short. We were all a bit fatigued from not great sleep, a cold or early flu or something (no, not COVID), and in general we didn’t do as good a job as usual at planning this trip, and thus headed back home to Bellingham on Monday after Pacificon.

Thus we spent most of this week driving back, and catching up on deferred chores at home, and resting and recuperating. Unfortunately, my long writeup of what I saw at Pacificon will have to wait until next week, including notes from my presentation there.

Fortunately, Josh Nass KI6NAZ of **Ham Radio Crash Course** YouTube channel was at Pacificon and did a video walkthrough of the exhibit area:

Searching for a Contact at Kenwood Regarding the “2025 TM-D720”

My use of the product name “TM-D720” for this new radio is entirely imaginary.

As discussed in the article in this issue **MMDVM-TNC is (Kind of) Real** below, there's a lot going on in Amateur Radio data communications on VHF / UHF that the engineers of the replacement for the venerable Kenwood TM-D710GA radio that will reportedly debut in 2025 (see **Zero Retries 0167** - New Kenwood Mobile (Data?) Radio Teased for 2025) might not be aware of.

I'll guess that the mandate of those Kenwood engineers is to create an equivalent of the TM-D710, just a *little* better (like a color LCD and maybe including the US 222 - 225 MHz band), but otherwise equivalent functionality to the Kenwood TM-D710GA - APRS, 9600 bps, etc. But such minimal feature advancement would be... unfortunate. One example of unfortunate "minimal feature advancement" is Icom's inclusion of *analog* television in the Icom IC-905 "microwave" radio, in this era when almost all Amateur Radio television activity is now *digital*.

One example about Amateur Radio data communications that Kenwood's engineers might not be aware of is the increasingly widespread use of Forward Error Correction (FEC) in Amateur Radio data communications - both FX.25 FEC (which is backward compatible with AX.25) and Improved Layer 2 Protocol (IL2P) which is an integral FEC system and thus more robust. There's also [Communications and Telemetry System \(CATS\)](#) which offers a lot of good ideas for a next generation APRS.

For those reasons, I'd love to have a conversation with the Kenwood engineers for the 2025 "TM-D720" radio to inform them about things they might wish to consider incorporating into the new radio before the design is completely locked down and put into mass production. Such a conversation could be permanently off the record as I have no agenda *other than seeing this new product being as capable as possible for data modes*, such as incorporating the two Amateur Radio FEC systems, and perhaps incorporating as many of the eight modes of MMDVM-TNC as the new radio is capable of. I'd also welcome the chance to make a case for incorporating a more capable internal TNC (if at all) and certainly the continuation of KISS mode, remote tuning, and a flat audio port.

Thus, if any Zero Retries readers *know the appropriate person to contact directly* at Kenwood (USA, or Japan) to initiate such a conversation, *or they could provide a mutual introduction*, on behalf of those intensely interested in data communications in Amateur Radio, I would sincerely appreciate it.

N8GNJ's Irrational Exuberance - Buying an NA6D AIOC

At Pacificon 2024, [NA6D](#) had a booth selling his implementation of the (open source) [All In One Cable \(AIOC\)](#). It was only \$30 with a 3D printed case (your choice of color), with no shipping charges. In one unit designed to plug into most portable radios (that have the "Kenwood standard" external speaker / microphone / programming jacks), an AIOC incorporates:

- An audio interface chip for doing data modes (modem)
- A digital level shifting chip for being able to program the radio using a system called [CHIRP](#).
- A USB-C connector
- All in an open source design

In theory, you can take your portable radio, plug in the AIOC, plug a USB-C cable between the AIOC and your laptop, and you'll be on the air with a simple, inexpensive radio system to do data communications, or anything else that you can use a radio + modem combination for.

I thought "widely used audio interface chip", and USB-C, so it *ought to be "easy"* to get it up and running with my Kenwood TH-F6A portable radio, my Mac laptop, and a USB-C cable. Thus in my "irrational exuberance" mode, I bought a couple of the NA6D AIOC units, in addition to the one I had purchased via mail order.

TLDR; it wasn't / isn't easy to immediately put it to use.

That I couldn't get it to work quickly, with minimal preparation, is no fault of NA6D, or the folks behind the AIOC project.

*At the moment, AIOC is a **project**, not a product.*

NA6D and others who are selling assembled and tested AIOCs aren't pricing them to make them a product and provide conventional support for them. Thus in cases such as the AIOC, it falls on the user / buyer to figure things out and make it work for *their particular use case(s)* beyond what AIOC has documented to be known to work:

Compatibility - Software

- Direwolf as AX.25 modem/APRS en+decoder/...
- APRSdroid as APRS en+decoder
- CHIRP for programming
- VaraFM
- ... and more

Tested Radios (so far)

- Wouxun UV-9D Mate (CHIRP + APRS)
- Baofeng UV-5R (CHIRP + APRS)
- BTECH 6X2 (CHIRP)

In my case, there was no *easy* way to get up and running in a few minutes with the AIOC, sitting in my hotel room a few hours after purchasing the NA6D AIOC. I can see that it *can* be made to work, for example installing Dire Wolf on my Mac laptop, but that's a project that I wasn't prepared to tackle at the time.

One thing I was able to test is that I downloaded a temporary MacOS app for testing, and I was able to select the **AIOC by name** - kudos to whoever it was on the AIOC team that took the time (and probably, expense) to get the AIOC registered with the USB Implementers Forum so that it will "enumerate" *by name* and not some generic audio chip name.

If I'd been trying to use the AIOC on a Windows laptop (I'm sure there are a lot more packet radio apps for Windows than Mac), or a Raspberry Pi (Dire Wolf is very, very well documented there, including a lot of plug and play recipes), etc., things would probably have been easier to accomplish.

Another surprise was that the last time I monitored 144.39 MHz (the US national APRS frequency) in a major city, there was a lot of activity. In my hotel room in San Ramon, California for Pacificon 2024, I rarely heard any activity on 144.39. I don't know if that was from a poor location, or just a lack of activity. Thus I really couldn't tell whether the AIOC modem was working, or not. That will require a known good source of packet radio signals that I can test against.

My point in bringing up this experience is mostly to poke a bit of fun at myself for my *irrational exuberance* at times. As I attest here, these "getting ahead of your skis" moments *happen to me too, folks*. Thus I wanted to commiserate with all of us who read or watch some glowing review of a product or project and decide "Oh, that looks like fun" only to get bogged down in *actually* making it work. These sorts of things happen to all of us if we want to do anything but the most mundane activities, or just "pull out the money gun" for a completely turnkey experience. And, it happens to some of us more than once or (what it feels like) a little too often. So take heart (as will I) and keep plugging away at making progress. Once I've had a little bit of progress with the AIOC, I will report my findings and documentation in my N8GNJ Labs blog - www.n8gnj.org.

Have a great weekend, all of you co-conspirators in Zero Retries Interesting Amateur Radio activities!

Steve N8GNJ

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MMDVM-TNC is (Kind of) Real

By Steve Stroh N8GNJ

I've had several confidential email conversations earlier this year with Jonathan Naylor G4KLX, the primary developer of the Multi Mode Digital Voice Modem (MMDVM) software, about exciting features of the MMDVM-TNC data mode. Those exciting features (essentially, the full range of speed tiers) were revealed in a presentation at Pacificon, so now they can be written about in public.

MMDVM-TNC is a new, fast, robust data modem for Amateur Radio that was developed by Jonathan Naylor G4KLX, with assistance from Nino Carrillo KK4HEJ. MMDVM-TNC runs on the MMDVM hardware and incorporates a number of improvements above and beyond typical packet radio, even packet radio at 9600 bps.

Fast data modes are nothing new in radio technology - one example is the [WA4DSY 56k RF modem](#) that was first discussed in 1987. But, “fast” usually requires the use of wider channels. Both the WA4DSY 56k RF modem and [New Packet Radio \(NPR\)](#) can achieve speeds of 56 kbps requires a 100 kHz channel. At its fastest, NPR can do 1 Mbps but requires a 1 MHz channel. Thus, those speeds / channel sizes probably aren't “practical” in Amateur Radio VHF / UHF bands such as 144-148 MHz which are “fully occupied” especially in urban areas.

The reason that MMDVM-TNC and other faster (but not as fast as 100 kbps) data modes such as VARA FM *are* interesting is that they can achieve “reasonably fast” speeds in normal Amateur Radio channels such as 20 kHz, or perhaps two adjacent 20 kHz channels.

The primary reason I see huge potential in MMDVM-TNC is the idea that with the “simple” installation of an MMDVM unit into a typical FM repeater, that repeater can then be used for both FM and *fast* data (MMDVM-TNC) without sacrificing current uses of the repeater. FM users will still be able to use the repeater, but with the installation of an MMDVM programmed for MMDVM-TNC, the repeater can then be used for data.

In my observations (and borne out by everyone I've talked to) is that *most* Amateur Radio repeaters *in this era* are now *mostly* silent other than “drive time”, scheduled nets / exercises, and of course, emergencies. Thus using them for data when not otherwise in use for voice would inject new life, new uses for repeaters.

*I plan to do a future article in Zero Retries - **Explaining the Use Case for Data Over Repeater**, about why such a data capability is important.*

Attributes of MMDVM-TNC:

- MMDVM-TNC runs on existing MMDVM hardware such as the [ZumRadio MMDVM-Pi](#).
- MMDVM-TNC uses the same on-air waveform as Digital Mobile Radio (DMR) - (C)4FSK¹.
- Data speeds up to 9600bps works within a 12.5 kHz channel.
- Interleaved Forward Error Correction (FEC) - Improved Layer 2 Protocol (IL2P) is integrated to make the data transmission more robust.
- Using MMDVM-TNC requires only attachment using a [KISS interface](#) from other Amateur Radio software.

Because of the close development with Nino Carrillo KK4HEJ, developer of the [NinoTNC](#), the NinoTNC can, potentially, support the MMDVM-TNC data modes. KK4HEJ has tested some of the MMDVM-TNC modes on NinoTNC hardware, but MMDVM-TNC modes are not (yet) incorporated into current NinoTNC firmware. This is an exciting development because a simple, inexpensive NinoTNC can be a good “user” device for accessing a repeater that has incorporated MMDVM-TNC for data use.

There is still work to be done with MMDVM-TNC such as testing with various radios, but MMDVM-TNC can generate data rates as fast as 38,400 bps. In his talk, G4KLX discussed that his testing was limited to “across the bench” sans radios, but he thinks it’s unlikely that the fastest modes will prove practical as there are currently no radios (that he, nor I, are aware of) that could accommodate those faster, wider data signals.

Additional future work is to incorporate the other aspects of a data communications system such as the protocol. Any device with a KISS interface is just that - a modem, and thus requires the host computer to implement the on-air protocol such as AX.25. As Phil Karn KA9Q and Mike Cheponis K3MC explained in their 1987 paper [The KISS TNC: A simple Host-to-TNC communications protocol](#):

The KISS TNC solves these problems by eliminating as much as possible from the TNC software, giving the attached host complete control over and access to the contents of the HDLC frames transmitted and received over the air. This is central to the KISS philosophy: the host software should have control over all TNC functions at the lowest possible level.

The AX.25 protocol is removed entirely from the TNC, as are all command interpreters and the like. The TNC simply converts between synchronous HDLC, spoken on the full- or half-duplex radio channel, and a special asynchronous, full duplex frame format spoken on the host/TNC link. Every frame received on the HDLC link is passed intact to the host once it has been translated to the asynchronous format; likewise, asynchronous frames from the host are transmitted on the radio channel once they have been converted to HDLC format.

Of course, this means that the bulk of AX.25 (or another protocol) must now be implemented on the host system. This is acceptable, however, considering the greatly increased flexibility and reduced overall complexity that comes from allowing the protocol to reside on the same machine with the applications to which it is closely coupled.

The idea of the progressive speed tiers is to establish a fastest, reliable data speed between two or more stations (and especially, a repeater that has added a MMDVM and MMDVM-TNC mode). You can keep trying up through 38,400 bps. For example, using a radio with a connector for flat audio such as the [Yaesu FTM-6000R](#) or the [BridgeCom Systems BCM-220](#), “Mode 3” (14,400 bps) might prove to be reliable, so you could advance the speed to “Mode 4” (19200 bps) to see if that higher speed would also work reliably.

Mode	Description	D-Star	LED	DMR	LED	YSF	LED	P25	LED
1	1200 bps AFSK AX.25	On	Off	Off	Off	Off	Off	Off	Off
2	9600 bps C4FSK IL2P	Off	On	Off	Off	Off	Off	Off	Off
3	14400 bps C4FSK IL2P	On	On	Off	Off	On	Off	Off	Off
4	19200 bps C4FSK IL2P	Off	Off	Off	On	Off	Off	Off	Off
5	24000 bps C4FSK IL2P	On	Off	On	Off	Off	Off	Off	Off
6	28800 bps C4FSK IL2P	Off	On	On	Off	Off	Off	Off	Off
7	33600 bps C4FSK IL2P	On	On	On	Off	Off	Off	Off	Off
8	38400 bps C4FSK IL2P	Off	Off	Off	Off	On	Off	Off	Off

Note that other than G4KLX’s statement:

The 9600 bps mode fits in a 12.5 kHz bandwidth.

there’s no characterization of the signals resulting from the use of the six higher speed tiers - no channel size stated, etc. That’s going to require some additional research and testing.

Yet another task that’s not addressed in MMDVM-TNC (or NinoTNC) is that (again, as far as I’m aware), there’s no “negotiated speed shifting” between two stations about maximum common speed². Currently, in MMDVM-TNC, speeds are “static”. There’s no reason why there cannot be a negotiation between two

MMDVM-TNC stations over maximum common speed... it's just that work has not been done.

But, it's possible in the original use of MMDVM for an MMDVM to "switch" between different digital voice modes - an FM transmission one moment, an M17 transmission the next moment. I believe that's because the various MMDVM modes are all (configured to be) running in parallel on the MMDVM hardware.

A related task would be to establish a protocol for repeaters that want FM (or Digital Voice) activity to have priority over MMDVM-TNC to signal to MMDVM-TNC users to "hold off" on trying to use the repeater while there is voice activity. Data is patient - it will wait.

But, as *I think I understand* the situation, the MMDVM-TNC software is installed on an MMDVM and then the mode is assigned (again, *I think*) statically. Thus, an MMDVM-TNC modem is set to only decode and encode, for example:

Mode 4 - 19200 bps C4FSK IL2P

And *only* Mode 4 - until the configuration file is changed to use a *different* mode *and* the MMDVM is restarted.

G4KLX has done a good job in creating the capability of MMDVM-TNC, and to make it practical and useful and usable will require others to explore the potential of it, document it, and put it into actual use and develop reference implementations.

With these faster, well documented, easy to replicate data rates as an available reference, it's conceivable that new generations of inexpensive, simpler radios *specifically for Amateur Radio data communications* could be developed.

G4KLX has released all the source code for MMDVM-TNC in the **Mode N branch** of the MMDVM-TNC GitHub repository - <https://github.com/g4klx/MMDVM-TNC/tree/modeN>. While this software is written for the specifics of the processor and hardware of an MMDVM, that (original) hardware design is also open source and can be understood and thus entire stack could be "ported" to other Amateur Radio "modems" incorporate the MMDVM-TNC modes, including (for example), [Mobilinkd TNC-4](#), [Dire Wolf software TNC](#), and most interestingly, Software Defined Transceivers that support the [GNU Radio](#) SDR framework.

G4KLX didn't indicate that any plans to do additional work on MMDVM-TNC, at least in the immediate future. He stated that he has submitted a new grant with ARDC for continuation of his work on MMDVM in 2025. If he does receive that grant (and I hope he does...), perhaps additional work on MMDVM-TNC will be undertaken. But that is the beauty of open source - others can continue the work he has begun with MMDVM-TNC.

Thus my characterization of MMDVM-TNC in the title of this article - MMDVM-TNC is (*Kind of*) *Real*, is because while the base capabilities are now in place - software that works, on existing MMDVM hardware, is now available for use, it will require others, and additional development to make it a working system.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

Casual Conversation About Radio Jamming Overheard

An email from my friend Joseph Trimble WB7PKY. This conversation was overheard in the Bellingham,

Washington area.

Quick story for you. Not long ago I was standing in line at a store and overheard a conversation between two young men. They were considering buying equipment that would allow them to jam radio and cell phone signals. They knew there was such equipment available for purchase online as one of them mentioned the name of a site. They then went on to say that they knew others who were interested in jamming radio signals; they brought up jamming police radios among a few other radio sources such as cell phones, drones, airplanes, etc. It was a scary conversation. I didn't catch all the conversation as I had to check out. I wanted to tell them that jamming was illegal, but I couldn't catch up with them.

I replied:

Thanks for the heads up on this issue. I'm well aware of jamming systems - they're basically simple wide-band "garbage" transmitters, and jamming gotten even more capable with the advent of Software Defined Transmitters that can transmit anywhere from HF to microwave... fortunately, for the moment, only at low power. But in close proximity, such jamming, even at low power, can be very effective.

In Zero Retries, I've covered jamming (and its related technology - spoofing) in the context of widespread use (and subsequent dependence) on GPS

Typically, jamming is of interest / useful in committing crimes. One of the most widespread such uses is to jam Wi-Fi (especially 2.4 GHz Wi-Fi) so that "wireless security cameras" don't work to record images from burglaries.

But you're right, it's worrisome that such things are coming up in casual, overheard conversation. For what it's worth, I doubt that if you had been able to catch up with them and warn them that such things are illegal, would have influenced them.

Jamming (and that we've developed, and become dependent on) radio systems that are subject to easily being jammed and spoofed is worrisome. In the past we depended on such technologies being difficult to develop, and difficult to procure, and we had effective tracking / enforcement mechanisms - such as an FCC field office in Seattle. Now none of that is true.

Having the skillset "in the community" to be able to track down such malicious radio activity can be a huge benefit to a community by Amateur Radio. The FCC can, and does, track down such malicious activity, but there's only a handful of such teams now in the US (the FCC field office in Seattle was closed down decades ago now), and FCC teams have to travel, and they have a lot of requests / reports to try to track down and thus have to prioritize their available resources on the biggest threats like public safety or interference with air traffic communications. Thus Amateur Radio being able to systematically locate and document malicious interference to be able to explain their results to local law enforcement would be a welcome capability from us "radio hobbyists".

[219 MHz FCC Rules Revision Workshop Announcement](#)

From the Open Research Institute (ORI) blog:

All of us at ORI are looking forward to the "let's take back 219 MHz for innovative and awesome digital operations" workshop coming up in a few days. (This is a US centric spectrum management issue.)

The response has been very strong. Thank you!

Yes, the workshop will be recorded. No, it will not be successful without participation. If you care about completely unused VHF/UHF spectrum in the US, and want to see educational, modern, non-

commercial use of this band happen without unnecessary impediments and silly rules, then we need your input now.

Here's the link to RSVP (no you do not have to be an IEEE member to use vTools and sign up and attend):

<https://events.vtools.ieee.org/m/439290>

Even if you simply want a recording of the workshop, please register. Then you can get a notification.

If you would like to participate in "The Haunted Band" or any of the other 9 open source amateur radio projects at ORI, then it's easy to join.

Please visit <https://openresearch.institute/getting-started> to get involved.

I've registered and plan to attend this online event.

Introducing Meshtastic Solutions: Supporting the Future of the Open Source Meshtastic Project

From the Meshtastic blog:

The Meshtastic Team is excited to announce Meshtastic Solutions. This new venture will support the Meshtastic open source project, as well as provide a pool of expertise for anyone building tools and systems with Meshtastic. Meshtastic Solutions will ensure the long-term health and success of the Meshtastic team and ecosystem, as well as to spur development of the Meshtastic firmware, clients, libraries, and utilities.

This support will be fueled by partnerships with hardware vendors, many that you are familiar with, and some that are new to Meshtastic. In time, high quality devices will bear the Meshtastic seal of approval. Individual devices will be eligible for registration through Meshtastic, providing assurance of genuine hardware, as well as identity and cryptographic key attestation.

Meshtastic Solutions will also serve as a hub for businesses that need custom solutions or expert consultation within the Meshtastic ecosystem. Meshtastic Solutions is open for business for providing engineering, software solutions, and other support for custom use-cases. The first stage of this support is the Backer program, where existing manufacturers can financially support Meshtastic. This will be extended to include a full Partner program, offering in-depth design, close support, and device testing assistance. All with the goal of helping hardware vendors produce the best products possible for Meshtastic.

Meshtastic Solutions is separate from both the Meshtastic open source project, and Meshtastic LLC, the license and trademark holding entity. There will be no drastic changes to the Meshtastic project as a result of this new venture, with the exception of more development and higher quality products and solutions to choose from. This support from Backers and Partners will fuel some long-awaited milestones, including a well-tested Stable firmware release.

We're looking forward to a stronger Meshtastic ecosystem that continues in the strong open source legacy the project has worked hard to foster. Follow our progress at [Meshtastic.com](https://meshtastic.com), and feel free to contact us with questions or to discuss business opportunities.

This makes complete sense to me. As Alan Kay is famously [quoted as saying](#):

People who are really serious about software should make their own hardware.

I'm looking forward to identifying a good quality outdoor, mast mounted unit for Meshtastic, both a relay node

and connection over (Power Over) Ethernet for the equivalent of a base station unit for my radio desk. Nothing I've seen to date is what I've been looking for.

Raspberry Pi Continues New Accessory Products - Solid State Drive and AI HAT

Tom's Hardware - [Raspberry Pi announce branded range of NVMe SSDs and SSD kit:](#)

The Raspberry Pi SSD Kit is essentially the [Raspberry Pi M.2 HAT+](#) bundled with your choice of PCIe Gen 3 compliant M.2 2230 256GB (\$30) or 512GB (\$45) M.2 NVMe SSD. The 256GB drive will be available from launch, with the 512GB option available for pre-order, with stock arriving from late November. Kit prices, which include the M.2 HAT+ board are \$40 for the 256GB and \$55 for 512GB.

Raspberry Pi - [Introducing the Raspberry Pi AI HAT+ with up to 26 TOPS](#)

The AI HAT+ features the same best-in-class Hailo AI accelerator technology as our AI Kit, but now with a choice of two performance options: the 13 TOPS (tera-operations per second) model, priced at \$70 and featuring the same Hailo-8L accelerator as the AI Kit, and the more powerful 26 TOPS model at \$110, equipped with the Hailo-8 accelerator.

Not Amateur Radio, but definitely in support of Amateur Radio. The ability to embed AI applications on a standalone unit (not using AI compute resources via Internet) is, I think, going to be an important enabler of technological innovation in Amateur Radio, such as... (see next article).

[FreeDV 2.0.0-20241018 Released](#)

From the FreeDV blog:

This is the first preview release of FreeDV containing the new RADE mode. For more information about RADE's development, check out the blog posts on the FreeDV website:

...

<https://freedv.org/davids-freedv-update-september-2024/>

To understand FreeDV's implementation of RADE (Radio Auto Encoder) fully, you'll have to go through the blog posts listed in this article. Essentially, RADE is machine learning applied to the task of digital voice for radio communications. I don't think FreeDV is using any specialized "AI" hardware such as the Raspberry Pi AI HAT mentioned in the previous article... at least not yet. But when / if they do so... I'll guess that the results could be even more impressive.

As I understand it, RADE is far more flexible than a conventional ("fixed") digital voice Coder / Decoder (CODEC) and can adapt better and more flexibly / quickly to changing conditions on the radio channel, to individual speaker's voices (nuances), provides higher voice quality where possible, etc.

FreeDV's progress in 2024 was driven, at least in part, by a significant R&D grant from ARDC.

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Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a*

license to experiment with radio technology, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- **Annual Founding Members who generously support Zero Retries financially:**
 - Founding Member 0000 - Steven Davidson K3FZT (Renewed 2024)
 - Founding Member 0001 - Randy Smith WU2S (Renewed 2024)
 - Founding Member 0002 - Chris Osburn KD7DVD (Renewed 2024)
 - Founding Member 0003 - Don Rotolo N2IRZ (Renewed 2024)
 - Founding Member 0004 - William Arcand W1WRA (Renewed 2024)
 - Founding Member 0006 - Todd Willey KQ4FID (Renewed 2024)
 - Founding Member 0007 - Merik Karman VK1DF / VK2MKZ (Renewed 2024 *with two Founding Member subscriptions*!)
 - Founding Member 0008 - Prefers to Remain Anonymous 14 (Renewed 2024)
 - Founding Member 0009 - Prefers to Remain Anonymous 19
 - Founding Member 0011 - Rick Prelinger W6XBE (New 2024)
 - Founding Member 0012 - Ryan Tolboom N2BP (New 2024)
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and include a link:
<https://www.zeroretries.org>
- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
Zero Retries Adminstrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions “Zero Retries Interesting” topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions “Zero Retries Interesting” topics so regularly on his blog (that I otherwise

wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.

- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories that often feature “Zero Retires Interesting” topics.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- [Hot Iron - The Journal of the Constructor's Club](#) is a delightful quarterly newsletter.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

These podcasts regularly feature Zero Retries Interesting content:

- [Store and Forward](#) - a podcast about the past and future of amateur radio, by Kay Savetz K6KJN (curator of the [Digital Library of Amateur Radio and Communications](#)) and Steve Stroh N8GNJ (Editor of Zero Retries).
- [Ham Radio Workbench](#) by George Zafiropoulos KJ6VU (and friends)
- [Foundations of Amateur Radio](#) by Onno Benschop VK6FLAB

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join **2200+** other subscribers:

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Leave a comment

If you're a fellow smart person that uses **RSS**, there *is* an **RSS feed for Zero Retries**.

Social Media:

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Zero Retries (N8GNJ) is also on Bluesky — [@n8gnj](#) — just click:

[Zero Retries / N8GNJ on Bluesky](#)

Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs in Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2024-10-25

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Footnotes for this Issue

[1](#)

I would normally link to an explanatory article for “C4FSK” or just 4FSK (which seems to be the more common reference for the modulation used by Digital Mobile Radio), but I was unable to a good *general* explanation suitable for Zero Retries.

[2](#)

“Negotiation of maximum speed in common between two stations” is one of the strongest aspects of VARA FM (and VARA HF).